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CARABID FAUNA OF A SANDY GRASSLAND

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Abstract

58 carabid species were collected in four years on a sandy grassland (Kiskunság National Park) isolated from grazing. The four dominant species (*Zabrus spinipes* (F.), *Harpalus servus* (DUFT.), *Harpalus picipennis* (DUFT.) and *Calathus erratus* SAHLB.) made up 86.3% of the total number of specimens.
Key words: Carabidae, sandy grassland, faunistics

Introduction

Carabidae are an important group of generalist soil predators. Numerous laboratory and field studies have been performed concerning their environmental demands and nutrition (THIELE, 1977). Several papers have been published on carabid assemblages, too, mainly in forests or agroecosystems or under an oceanic climate in higher geographical latitudes (e.g. FERGUSON and MCPHERSON, 1985; LOREAU, 1983; 1984; STRÜVE-KUSENBERG, 1980; KLEINERT, 1983; NIEMELA et al., 1986; BAARS, 1979). Only a small part of the extensive literature reports on studies of ground beetles living on sandy grasslands under a continental climate (THIELE, 1977). The present paper describes qualitative and quantitative data on the carabid fauna of a typical sandy grassland in Hungary.

Study area and sampling methods

Our study area is situated in the eastern part of the Bócsa—Bugac region of the Kiskunság National Park, Hungary. It consists of sand-dunes with a height of 1—3 metres. Because of the long-term intensive grazing, the main plant association on the grazing land is *Potentillo-Festucetum pseudovinae* (names after SOÓ (1964)), with scattered patches of ruderal associations (e.g. *Brometum tectorum*).

In 1976, a 2.4 ha plot of pasture was fenced in to eliminate the destructive effects of grazing. In this area, *Festucetum vaginatae* plant association has developed on the top of the dunes, and *Molinio-Salicetum rosmarinifoliae* in the hollows, this reflects the secondary succession.

Several appropriate methods are known for sampling carabid assemblages (SOUTHWOOD, 1966; HORVATOVICH, 1981). We collected beetles not only with pitfall traps, but also by hand-picking. Pitfall trapping may underestimate carabid population densities compared with extraction methods (THIELE, 1977). The size-dependennt mobilities of the species and the differences in relative plant cover around the traps may distort frequency relations among species (REFSETH, 1980). In spite of these facts, a reliable relative size of a carabid population can be obtained trought continuous pitfall catches (BAARS, 1979).

On the presumably different sites, 14 groups of 5 pitfall traps containing ethylene-glycol as preservative were placed on the enclosed area. They were emptied fortnightly or monthly from April to November. The present analysis is based on 2686 specimens collected predominantly with the traps, but partly by hand, during four years (1979—1982).

Result and discussion

58 species were found on the study area during the four years. This is 19.7% of the total number of all the carabid species found so far in the whole (and highly heteromorph) Kiskunság National Park (ÁDÁM and MERKL, 1986). 77.2% of the present species were collected in the pitfall traps (Table 1). *Harpalus subcilindricus* DEJ. have not been collected from the areas of the National Park before.

The qualitative composition of the assemblage is similar to those described from other sandy areas (HEERD and MÖRZER-BRUYNS, 1960; THIELE, 1977). We found numerous psammophilic species (e.g. *Calathus erratus, Calathus melanocephalus* and *Harpalus servus*), that are often found in agricultural areas. Their occurrence is independent of the composition of the plant communities (SCHJOTZ-CHRISTENSEN, 1957; MOSSAKOWSKI, 1970; PREISZNER, 1987). The majority of the *Harpalus* species, which make up the 35% of the total number of species caught, are also psammophilic (THIELE, 1977). The high species richness of the *Harpalini* may be explained as "taxonomically closely related (carabid) species are also ecologically closely related, and will thus more often than not be found coexisting in the same habitats" (DEN BOER, 1980).

High heat conductivity and poor water retention ability of sandy soils are features preferred thermophilic (e.g. *Harpalus smaragdinus*) and xerophilic (e.g. *Amara fulva*) species (THIELE, 1977). Results of detailed studies on carabid beetles also emphasise the important effect of abiotic factors on the frequency and distribution of the species (THIELE, 1977; DEN BOER, 1980).

In spite of the great number of species, the cumulative relative frequency of the four dominant species (*Harpalus servus, Harpalus picipennis, Calathus erratus* and *Zabrus spinipes*) is 86.3%. Among them, *Zabrus spinipes* has extremely high relative frequency (34.1%). This species was described as a characteristic of a Southern—Russian sandy grassland (GHILAROV, 1961).

86% of the species were rare (RF%<1). Some of them may have immigrated from the forest (e.g. *Carabus violaceus*), the sodic soil areas (e.g. *Lophyridia lunulata*) or from bare, plantless areas (e.g. *Cicindela hybrida*).

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Table 1. Total number of individuals (N) and relative frequency (RF%) of carabid beetles caught by pitfall trapping over four years (x denotes beetles caught by hand only).

Species	N	RF%
Cicindela hybrida LINNAEUS, 1758	1	0.04
Cicindela campestris LINNAEUS, 1758	x	
Cylindera germanica LINNAEUS, 1758	1	0.04
Cylindera arenaria FUESSLIN, 1775	x	
Lophyridia lunulata nemoralis OLIVIER, 1790	x	
Calosoma auropunctatum (HERBST, 1784)	1	0.04
Carabus violaceus LINNAEUS, 1758	x	
Carabus granulatus LINNAEUS, 1758	x	
Carabus cancellatus ILLIGER, 1798	x	
Scarites terricola BONELLI, 1813	3	0.11
Dyschirius aeneus (DEJEAN, 1825)	x	
Broscus cephalotes (LINNAEUS, 1758)	2	0.08
Trechus quadristriatus (SCHRANK, 1781)	2	0.08
Bembidion properans STEPHENS, 1829	1	0.04
Anisodactylus signatus (PANZER, 1797)	x	
Harpalus azureus (FABRICIUS, 1775)	x	
Harpalus rufipes (DE GEER, 1774)	6	0.22
Harpalus griseus (PANZER, 1797)	7	0.26
Harpalus flavescens (PILLER & MITTELPACHER, 1783)	2	0.08
Harpalus froelichi STURM, 1818	1	0.04
Harpalus hirtipes (PANZER, 1797)	1	0.04
Harpalus affinis (SCHRANK, 1781)	1	0.04
Harpalus melancholicus DEJEAN, 1829	1	0.04
Harpalus rubripes (DUFTSCHMID, 1812)	1	0.04
Harpalus smaragdinus (DUFTSCHMID, 1812)	21	0.78
Harpalus distinguendus (DUFTSCHMID, 1812)	1	0.04
Harpalus pygmaeus DEJEAN, 1829	x	
Harpalus autumnalis (DUFTSCHMID, 1812)	27	1.01
Harpalus serripes (QUENSEL, 1806)	x	
Harpalus servus (DUFTSCHMID, 1812)	544	20.25
Harpalus albanicus REITTER, 1900	3	0.11
Harpalus anxius (DUFTSCHMID, 1812)	3	0.11
Harpalus subcylindricus DEJEAN, 1829	1	0.04
Harpalus picipennis (DUFTSCHMID, 1812)	447	16.67
Harpalus tardus (PANZER, 1797)	2	0.08
Bradycellus harpalinus (SERVILLE, 1821)	x	
Acupalpus luteatus (DUFTSCHMID, 1812)	2	0.08
Pterostichus vulgaris (LINNAEUS, 1758)	x	
Calathus fuscipes (GOEZE, 1777)	36	1.34
Calathus erratus (C. R. SAHLBERG, 1827)	409	15.23
Calathus ambiguus (PAYKULL, 1790)	83	3.10
Calathus melanocephalus (LINNAEUS, 1758)	23	0.86
Dolichus halensis (SCHALLER, 1783)	x	
Zabrus spinipes (FABRICIUS, 1798)	917	34.14
Zabrus tenebrioides (GOEZE, 1777)	5	0.19
Amara equestris (DUFTSCHMID, 1812)	6	0.22
Amara aulica (PANZER, 1794)	2	0.08

Amara fulva (D. F. MÜLLER, 1776)	12	0.45
Amara anthobia VILLA, 1833	1	0.04
Amara ovata (FABRICIUS, 1792)	1	0.04
Amara lucida (DUFTSCHMID, 1812)	1	0.04
Amara aenea (DE GEER, 1774)	20	0.74
Amara bifrons (GYLLENHAL, 1810)	6	0.22
Amara municipalis (DUFTSCHMID, 1812)	1	0.04
Panagaeus bipustulatus (FABRICIUS, 1775)	2	0.08
Masoreus wetterhalli (GYLLENHAL, 1813)	75	2.79
Syntomus pallipes DEJEAN, 1825	1	0.04
Microlestes maurus (STURM, 1827)	3	0.11
Total	2686	100

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